Citation:

Alonso A, Beunza JJ, Delgado-Rodríguez M, Martínez JA, Martínez-González MA. Low-fat dairy consumption and reduced risk of hypertension: the Seguimiento Universidad de Navarra (SUN) cohort. *Am J Clin Nutr.* 2005 Nov; 82(5): 972-979.

PubMed ID: 16280427

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To assess whether total, low-fat and whole-fat dairy consumption is associated prospectively with the risk of hypertension (HTN).

Inclusion Criteria:

- Age more than 20 years
- University graduate.

Exclusion Criteria:

- History of CVD, cancer or diabetes or prevalent HTN at baseline
- Extreme total energy intake
- Missing values for any of the variables included in analyses.

Description of Study Protocol:

Recruitment

All former students of the University of Navarra, registered nurses from some Spanish provinces and university graduates from other associations received a mailed questionnaire and a letter of invitation to participate in the Seguimiento Universidad de Navarra Study.

Design

- Prospective analyses of University of Navarra Follow-up Study (Seguimiento Universidad de Navarra)
- Participants completed mailed questionnaires at baseline and biennially

- All variables are self-reported.

Dietary Intake/Dietary Assessment Methodology

Validated semi-quantitative food-frequency questionnaire (FFQ) (137-item and open-label questions); dairy intake assessed in 15 items.

Statistical Analysis

- Hazard ratios (HRs) and their 95% CIs were estimated with Cox proportional hazards models, with adjustment for potential confounders. An initial model included only age and sex as covariates
- Additional risk factors for HTN where then included (physical activity, BMI and alcohol and sodium intakes) and variables closely associated with lifestyle and health-related habits (smoking and a history of hypercholesterolemia) in a first multivariate model
- Finally, to assess the possibility of confounding by other dietary variables, the authors ran another multivariate model (multivariate two), which added several dietary factors that have been related to the risk of HTN in some studies
- In all analyses, the reference group was the lowest intake category
- Multivariable tests for linear trends were conducted by assigning the median value to each quintile and modeling these values as a continuous variable. All P-values are two-tailed. Statistical significance was set at $P<0.05$.

Data Collection Summary:

Timing of Measurements

Baseline and two-year follow-up.

Dependent Variables

Self-reported blood pressure and HTN.

Independent Variables

Total, whole and low-fat dairy consumption.

Control Variables

- Age, sex, BMI, physical activity, alcohol consumption, sodium intake, total energy intake, smoking, hypercholesterolemia
- Fruit, vegetable, fiber, caffeine, magnesium, potassium, monounsaturated fatty acid, and saturated fatty acid intakes.

Description of Actual Data Sample:

- *Initial N:* 6,686
- *Attrition (final N):* 5,880 (88%)
- *Mean age:* 37 years
- *Anthropometrics:* BMI (SD) by quintile of total dairy product consumption:
  - Q1: 23.2 (3.5) kg/m^2
  - Q2: 23.2 (3.3) kg/m^2

- Q3: 23.3 (3.3) kg/m^2
- Q4: 22.9 (3.2) kg/m^2
- Q5: 22.9 (3.1) kg/m^2

- *Location:* Spain.

Summary of Results:

Key Findings

- 180 new cases of HTN were identified
- HRs and 95% CI of HTN between extreme quintiles of dairy product consumption in the fully adjusted model containing the main known risk factors for HTN and several dietary factors:
  - *Total dairy:* 0.75 (95% CI: 0.45, 1.27; P=0.12)
  - *Low-fat dairy:* 0.46 (95% CI: 0.26, 0.84; P=0.02)
  - *Whole-fat dairy:* 1.37 (95% CI: 0.77, 2.42; P=0.44).

Author Conclusion:

In this Mediterranean cohort, low-fat dairy consumption, but not whole-fat dairy consumption, was associated with a lower risk of incident HTN.

Reviewer Comments:

All variables are self-reported. However, a validated FFQ was used and a validation study of self-reported diagnosis of HTN was conducted in a similar highly educated cohort.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	N/A

4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	N/A
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes

7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	N/A
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes